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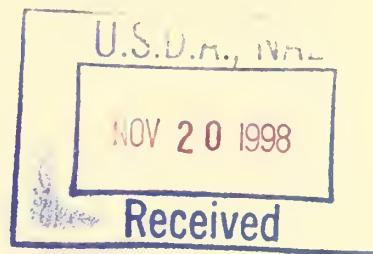
Food Safety
and Inspection
Service



United States
Department of
Health and
Human Services

Food and Drug
Administration

Preventing Foodborne Listeriosis



Listeria are bacteria found frequently in the environment. One *Listeria* species, *Listeria monocytogenes*, can cause the serious foodborne illness listeriosis. Healthy people rarely contract listeriosis, but the illness can be serious for some people, especially the elderly, newborns, pregnant women and those with weakened immune systems.

This backgrounder is written for consumers: To answer questions frequently asked about *L. monocytogenes* and the illness it causes, to describe public health and enforcement activities being conducted by the Federal government to control *L. monocytogenes*, and to outline precautions consumers and other food handlers can take to keep food safe and prevent listeriosis.

The Food and Drug Administration (FDA), the Food Safety and Inspection Service (FSIS) and the Centers for Disease Control (CDC) are working together to provide the public with this information. Pregnant women and immune-compromised consumers may also wish to contact their physicians with questions about listeriosis.

The Organism

Description

Listeria refers to a genus (related group) of bacteria. One species in this genus, *Listeria monocytogenes*, can cause a serious bacterial infection called listeriosis. Usually when public health officials refer to *Listeria*, they are referring specifically to *Listeria monocytogenes*.

Where Is It Found?

Researchers have isolated *L. monocytogenes* from soil, leaf litter, sewage, silage, dust and water. The organism often moves through the animal and human intestinal tract without causing illness, and has been found in many domestic and wild animals, including birds and fish. Because *L. monocytogenes* is widely present in the environment, it would be impossible to prevent animals from coming in contact with the bacteria. However, farmers, animal producers, food processors and food handlers can all take steps to reduce contamination and keep food safe from *L. monocytogenes*.

Is It New?

L. monocytogenes is not "new." Since 1911, scientists have known it infects animals, and in 1929 the first case of human infection was detected.

What is new is the recognition that *L. monocytogenes* bacteria may be spread in food. In earlier times, many believed farm animals transmitted *L. monocytogenes* to farm workers. But, when listeriosis appeared in city dwellers, public health

authorities realized that animal contact was not always the source of disease transmission.

It has been only in the past decade that researchers have recognized *L. monocytogenes* as an agent of foodborne illness. Fecal contamination is one way the organism is spread to raw agricultural products. For example, farm animals may pick it up from consuming improperly fermented silage, and then vegetables may become contaminated when animal manure carrying the organism is used for fertilizer. Animals in a herd also may pick up *L. monocytogenes* from other animals or manure containing the organism.

Is It Unusual?

L. monocytogenes is a remarkably tough organism. It resists heat, salt, nitrite and acidity much better than many organisms. The bacteria survive on cold surfaces and also can multiply slowly at 34 degrees Fahrenheit, defeating one traditional food safety defense—refrigeration. (Refrigeration at 40 degrees Fahrenheit or below stops the multiplication of many other foodborne bacteria. Refrigeration does not kill most bacteria.) Commercial freezer temperatures of 0 degrees Fahrenheit, however, will stop *L. monocytogenes* from multiplying.

Discrepancies in information available on proper cooking prompted FSIS in 1988 to contract with a private laboratory to conduct research that has become the basis for FSIS regulations on proper cooking of roast beef. Earlier work focused on cooking temperatures and times needed to destroy *Salmonella*. The new study conducted by the laboratory looked at cooking temperatures and times that will destroy *L. monocytogenes*, and confirmed the adequacy of current regulatory cooking standards for eliminating the organism in FSIS-regulated products.

In addition, FDA researchers and FDA-funded research have confirmed the adequacy of commercial pasteurization for eliminating the organism in dairy products.

Post-processing contamination, rather than failure of heating or pasteurizing processes, is usually suspected when *L. monocytogenes* is detected on processed products.

Once *L. monocytogenes* were identified as foodborne bacteria that could cause serious illness, scientists began looking at methodology used to detect the bacteria. FSIS scientists developed a more precise method for detection in meat and poultry products. FDA scientists developed a similar method appropriate for dairy products, seafood and vegetables. These methods have steadily improved over the years.

FDA and FSIS developed culture procedures that rely on the presence of antibiotics in the medium, which allow multiplication of *L. monocytogenes* but inhibit multiplication of competing organisms. In 1986, independent laboratories verified the accuracy of the new FSIS method for meat and poultry. The FDA method has also been reviewed and accepted.

As more is learned about the bacteria and their control, new and even better tests are being developed. An example is FDA's gene-probe method.

The Illness

How Is It Transmitted?

Listeriosis is the disease caused by the bacteria *L. monocytogenes*. Consumers most commonly contract listeriosis by eating food contaminated with the organisms. (See section on "Who is most at risk?")

Also, the scientific literature contains a few isolated reports of occupational listeriosis; for example, farm workers and veterinarians who work with animals have developed minor skin infections.

Who Is Most At Risk?

Healthy people do not often develop noticeable listeriosis symptoms after eating food containing *L. monocytogenes*. However, some people are very susceptible to the disease.

The highest incidence of listeriosis has been in persons over 60 years old and newborns. One third of infections occur during pregnancy and may lead to spontaneous abortions or serious illness in newborns. Others most at risk include patients with immune systems compromised by cancer, AIDS, or immunosuppressive medications such as steroids; and patients suffering from cirrhosis, diabetes and ulcerative colitis.

What Are The Symptoms?

The disease symptoms are variable and depend on the individual's susceptibility. Symptoms may be limited to fever, fatigue, nausea, vomiting and diarrhea. However, these symptoms can precede a more serious illness.

The more serious forms of listeriosis can result in meningitis (brain infections) and septicemia (bacteria in the bloodstream). Pregnant women may contract flu-like symptoms of listeriosis; complications can result in miscarriage, stillbirth, or septicemia or meningitis in the newborn. In older children and adults, complications usually involve the central nervous system and blood stream, but may include pneumonia and endocarditis (inflammation of the lining of the heart and valves). Skin contact with *L. monocytogenes* can cause localized abscesses or skin lesions.

It takes from one to six weeks for a serious case of listeriosis to develop, although flu-like symptoms may occur 12 hours after eating *L. monocytogenes*-contaminated food. Onset time probably depends on the health of the patient, the strain of *L. monocytogenes* and the dose—or amount of bacteria—ingested.

Outbreaks

Four reported outbreaks of listeriosis in North America in the past decade are either known or suspected to have been caused by *L. monocytogenes* in food.

- * An outbreak in 1981 in Nova Scotia resulted in 41 cases of listeriosis including 18 deaths; 83 percent of the cases were perinatal (occurring near the time of birth). The outbreak was traced to *L. monocytogenes* on coleslaw that had been made from cabbage grown in a field fertilized with manure from *Listeria*-infected sheep.
- * An outbreak in 1983 in Boston resulted in 49 cases of listeriosis including 14 deaths; 14 percent of the cases were perinatal, the remainder in immunocompromised adults. Although pasteurized milk from *Listeria*-infected dairy cows was linked to the outbreak, *L. monocytogenes* was not found in the suspected brand of milk.
- * An outbreak in 1985 in Los Angeles resulted in 142 cases of listeriosis including 46 deaths; 85 percent of the cases were perinatal. The outbreak was traced to *L. monocytogenes* on soft, Mexican-style cheese, manufactured with contaminated milk.
- * An outbreak in Philadelphia in 1987 resulted in at least 32 cases of listeriosis, including 11 deaths. The cause was never identified.

...And Other Cases Linked To Food

The Food and Drug Administration funded a Centers for Disease Control (CDC) active surveillance project in 1986. CDC began contacting all acute care hospitals and their respective laboratories in an area that included five states and Los Angeles county.

From the 1986-1987 study results, as well as from findings in studies conducted from 1989-1990, CDC determined that sporadic (non-outbreak) individual cases of listeriosis were associated with soft cheese, undercooked poultry, hot dogs not thoroughly reheated and food purchased from delicatessen counters.

How Much Can You Eat Before Getting Sick?

Researchers are not sure how many *L. monocytogenes* organisms it takes to cause illness. The infective "dose" varies, depending on the susceptibility of the individual. (See "Who is most at risk," p. 3.) However, it is noteworthy that four of the ill persons in the Los Angeles outbreak reported eating the implicated product (highly contaminated soft cheese) only once.

Thorough cooking will destroy *L. monocytogenes* on foods. Nonetheless, FDA and FSIS are committed to reducing contamination of raw foods by *L. monocytogenes* and other potentially harmful bacteria.

What Is The Incidence?

From information gathered in its surveillance projects conducted in the 1980s, CDC projects about 1,850 cases of human listeriosis occur annually. Incidence, however, varies from state to state. CDC is now encouraging state health departments to conduct surveillance programs for listeriosis so that outbreaks may be rapidly identified and investigated. As our population ages and more people live longer with malignancies and other immunosuppressive illnesses, many experts believe the number of people at risk for listeriosis is likely to increase.

Surveillance data also indicate that about 425 deaths occur each year in the United States. The probability of death varies greatly depending on the patient's age and status of immune function. (See section on "Who is most at risk?") About 5 percent of the 9,000 food poisoning deaths each year are due to listeriosis.

Preliminary data suggest that the rate of listeriosis may have *declined* substantially during 1991 in several areas, perhaps related to intensified efforts to reduce *Listeria* contamination of foods.

How Is Listeriosis Diagnosed and Treated?

Listeriosis can be positively diagnosed, using clinical laboratory techniques, only by culturing the organism from blood or cerebrospinal fluid. Listeriosis can be treated with antibiotic drugs such as penicillin or ampicillin.

What Is The Government Doing?

Neither FSIS nor FDA will accept any detectable *L. monocytogenes* on cooked, ready-to-eat food. This is called a "zero tolerance" for the bacteria.

Both agencies have testing programs for *Listeria monocytogenes*. The goal of these programs is to help government and industry identify the causes of contamination in processing plants and to make permanent changes that will reduce *Listeria monocytogenes* contamination, prevent problems and ensure a safe food supply. Both agencies can hold or detain products at the food processing plant, request a voluntary recall of the product or seize products through court order if necessary.

Initially, FSIS regulatory testing programs included selected cooked meat products. Following a CDC report that traced the first case of listerial meningitis to incompletely heated turkey franks consumed by a cancer patient, FSIS expanded the *L. monocytogenes* monitoring program to further prevent the sale of any cooked and ready-to-eat meat or poultry products from which *L. monocytogenes* is isolated, such as cooked sausages (including frankfurters and bologna), cooked roast beef, cooked corned beef, sliced canned ham, sliced canned luncheon meat, jerky, cooked poultry, and poultry and meat salads and spreads.

When a ready-to-eat meat or poultry product is found to contain *L. monocytogenes*, the plant is notified and the product is subject to detention at the plant, voluntary recall or court-ordered seizure. From 1987 through March 1992, 27 FSIS-regulated cooked products from 27 firms have been recalled, including frankfurters, bologna and other luncheon meat, chicken salad, ham salad, sausages, chicken, sliced turkey breast and sliced roast beef.

FDA's monitoring programs initially concentrated on cheese and dairy products, both domestic and imported. Later, FDA expanded coverage to include other ready-to-eat foods such as sandwiches, prepared salads and smoked fish. From 1987 to March 1992, 516 products from 105 firms have been recalled.

The agencies' stepped up monitoring and surveillance programs for *L. monocytogenes*, and food industry efforts have helped identify intervention measures aimed at controlling the organism.

Controlling *Listeria* In The Plant

FSIS and FDA have identified the Hazard Analysis and Critical Control Point (HACCP) system as the most effective strategy for controlling the presence of *L. monocytogenes* and other pathogenic bacteria on food products. In addition to encouraging adoption of this strategy by all who handle food, from farmworker to plant processor to consumer, the agencies are working with industry to design strong HACCP programs. Most of the food industry supports HACCP.

In a HACCP program, points at which food risks are more likely to be introduced are identified, and interventions are introduced where control is possible to reduce the potential for consumption of unsafe products. For instance, insufficient cooking of raw meat, poultry or milk may allow the survival of pathogenic bacteria and present a hazard. Therefore, the agencies require adequate cooking temperatures to destroy the bacteria.

Areas of concern in food processing plants include plant design and layout, equipment design, process control, personnel practices, cleaning and sanitizing procedures, and verification of pathogen control.

Much of the dairy industry has already instituted control measures, based on HACCP principles. Other FDA-regulated industries are following the lead. In 1987, meat companies began to modify production facilities, such as rearranging plant layout and making changes in equipment. An industry working group also developed recommendations for all meat companies based on what is learned, and developed a training video on employee practices and plant hygiene. The poultry industry also instituted improvements.

The food industry, FSIS and FDA have conducted workshops to develop recommendations for controlling risks at critical points. Government and industry, including food processors and grocers, are also working with retail establishments and hotels and other institutions to identify critical control points and interventions to address hazards.

Food Handler Control

Listeria bacteria do not change the taste or smell of a food. As a final check, food handlers--in homes, restaurants and institutional kitchens--must follow basic food safety procedures for destroying any potentially harmful bacteria, thereby avoiding any foodborne illness.

The Centers for Disease Control, FDA, FSIS and the National Advisory Committee on Microbiological Criteria for Foods (which includes food scientists from Federal health agencies, universities and private industry) have developed food handler advice for preventing listeriosis.

Recommendations For All Individuals

Although most people are at very low risk for listeriosis, the risk of listeriosis and other foodborne illnesses can be reduced by following these tips:

- Avoid raw/unpasteurized milk.
- Keep raw and cooked foods separate when shopping, preparing, cooking and storing foods. Otherwise, bacteria in juices from raw meat, poultry or fish might contaminate a cooked food. For instance, transfer cooked meat, poultry or fish to a clean platter--never to the dish that held the raw food of animal origin.
- Wash hands, knives, and cutting boards after handling uncooked foods.
- Wash raw vegetables thoroughly before eating.
- Thoroughly cook all food of animal origin, including eggs. Cook raw meat to an internal temperature of 160 degrees Fahrenheit, raw poultry to 180 degrees Fahrenheit, and raw fish to 160 degrees Fahrenheit or until it is white and flaky. Reheat leftovers thoroughly.
- Read and follow label instructions to "keep refrigerated" and "use by" a certain date.
- Keep hot foods hot (above 140 degrees Fahrenheit). Do not keep them out for longer than two hours at room temperature—at which *L. monocytogenes* can thrive—before eating.
- Keep cold foods cold (at or below 40 degrees Fahrenheit). Do not keep them out for longer than two hours at room temperature before eating.
- Divide leftovers into small, shallow covered containers before refrigerating, so that they chill rapidly and evenly.
- Keep your refrigerator *clean* and keep the temperature at 34-40 degrees Fahrenheit.

Recommendations To High-Risk Individuals

Persons at increased risk for listeriosis such as pregnant women, the elderly, and those with immunosuppressive conditions can decrease the risk by:

- Avoiding soft cheese such as Mexican style, feta, Brie, Camembert and blue cheese. Mexican-style cheeses are soft, white, ethnic (Hispanic-Latin American) cheeses such as Queso Blanco and Queso Fresco. There is no need to avoid hard cheese, processed slices, cottage cheese or yogurt.

- Reheating leftover foods or ready-to-eat foods such as hot dogs thoroughly until steaming hot before eating.
- Although the risk of listeriosis associated with foods from delicatessen counters is relatively low, pregnant women and immunosuppressed persons may choose to avoid these foods or to thoroughly reheat cold cuts before eating.

Resources For Consumers

Because listeriosis presents a special risk for pregnant women, newborns, the elderly, and those with weakened immune systems—the Federal government has begun a campaign to distribute information about *L. monocytogenes* to government agencies and private groups serving those at risk.

As part of this campaign, FSIS is working with the Administration on Aging to develop fact sheets for the elderly about foodborne illness. FSIS also is working with USDA's Food and Nutrition Service's Special Supplemental Program for Women, Infants, and Children (WIC) to distribute information through WIC clinics. In addition, FSIS distributes several publications that address the problem of listeriosis, especially for those in at-risk groups. These publications include:

- "Is Someone You Know at Risk for Foodborne Illness?"
- "FSIS Facts: Bacteria that Cause Foodborne Illness"
- "A Quick Consumer Guide to Food Handling" (for consumers)
- "Preventing Foodborne Illness: A Guide to Safe Food Handling" (for extension agents and health educators)

You can order these publications from: FSIS Publications
 USDA
 Room 1165, South Building
 Washington, D.C. 20250

FDA is participating in educational campaigns and also distributes publications about *L. monocytogenes*. These include:

- "*Listeria*, Battling Back Against One 'Tough Bug'"
- "Listeriosis: A Deadly Danger"
- "Guarding Against *Listeria* at Home"
- "Eating Defensively: Food Safety Advice for Persons with AIDS"

You can order copies from: Food and Drug Administration
 HFE-88
 5600 Fishers Lane
 Rockville, MD 20857

In addition, for answers to your food safety questions, call USDA's Meat and Poultry Hotline at 1-800-535-4555. (In the Washington, D.C., area, call 202-720-3333.) Hotline hours are from 10 a.m. to 4 p.m., Eastern time.

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For More Information

FSIS

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CDC

Media Inquiries: Office of Public Affairs (404) 639-3286
Technical questions about listeriosis: Meningitis and Special Pathogens Branch (404) 639-2215